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THE IMPROVED LAKEFILL QUALITY CONTROL PROGRAM

A COMPREHENSIVE REVIEW

1991

contains recycled material

The Metropolitan Toronto and Region Conservation Authority

IMPROVED LAKEFILL QUALITY CONTROL PROGRAM

MONTHLY REPORT

November 1992

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A/ Background of the Improved Lakefill Quality Control Program

In 1982, the Ontario Ministry of the Environment (MOE) initiated the Lakefill Quality Assurance Program (LQAP) in order to control the quality of lakefill generated in specific areas of the City of Toronto. The program designated the area bounded by Queen St. to the north, Roncesvalles Ave. to the west, Leslie St. to the east and Lake Ontario to the south as the Designated Control Area (DCA). All fill within this area had to be chemically tested in order to determine it's suitability as lakefill. This particular geographic region was singled out because of its close proximity to the Leslie St. Spit, its largely industrial makeup and its high fill content. It was hoped that since a large percentage of the lakefill material taken to the Leslie St. Spit was generated in this area, the general quality of the lakefill material would improve. The formation of additional Designated Control Areas was also proposed for the LQAP, however, the program was replaced by the present procedures before these areas could be identified.

Particular concerns with the LQAP were :

i) A significant percentage of material deposited as lakefill was generated in areas outside of the DCA.

ii) Because the program did not employ a "weigh bill" system, it was impossible for the lakefill site operators to identify the origin of trucks carrying fill material to the lake.

In 1987, The MOE commissioned a study of the soil quality on the Leslie St. Spit and determined that much of the material deposited at the site exhibited concentrations of contaminants which exceeded the MOE's Open Water Disposal Guidelines. For this reason the LQAP was replaced with the Improved Lakefill Quality Control Program (ILQCP) on January 1, 1989.

B/ Achievements 1991

The Improved Lakefill Quality Control Program entered its third full year of operation in 1991 with the intention of maintaining the high standard of fill quality control that had been set the previous two years. In this section we will discuss the methods used by ILQCP staff to audit the effectiveness of the program as well as the changes and additions to the program in 1991. We will also discuss the results of the Chemical Test Audit and various other statistics associated with the ILQCP in 1991.

Audit System

The effectiveness of the ILQCP is assessed in two ways. The first way in which the program is audited is by physically inspecting the various lakefill generating sites and following trucks to and from lakefill sites. In this way staff ensure that the original conditions of lakefill approval are being met. These conditions are that ;

- the approved dispatcher is in control of the bills of lading
- material being lakefilled is originating from site sectors classified as acceptable for lakefilling
- soil types and descriptions correspond to the original report

The second method of assessing the effectiveness of the program is by obtaining soil samples from trucks of fill entering lakefill sites and comparing the test results with results included in the original environmental report. This second method, the Chemical Test Audit , will be discussed at length later.

Once an environmental report has been reviewed and approved, all ILQCP staff are briefed on the specific site conditions and conditions of approval. This briefing takes place during the ILQCP staff meeting which is held every three weeks. For each approved application, staff are briefed on the site history, soil stratigraphy, chemical analysis results of each soil layer and geographical area of the site, soil disposal requirements and contact names and/or companies in case of problems. With this information, ILQCP staff are able to perform site inspections to ensure compliance with the ILQCP conditions of approval.

There are many indicators, in addition to site inspections, which alert ILQCP staff members to potential violations of the conditions of approval. Changes in soil appearance or type, use of old bills of lading from completed projects and presence of volatile organic compounds in unusual levels are all ways in which the ILQCP staff are alerted to possible problems or changes which may have occurred at the soil generating site. The volatile organic levels mentioned above are detected through the use of the MicroTip photoionization detector which will be discussed in the next section. It is essential to the operation of the ILQCP that staff are available to look for these indicators, perform site inspections and inspect trucks at lakefill sites, because without them, the bills of lading might be routinely abused and therefore be unreliable indicators of the quality of material being lakefilled. The ILQCP has four full time staff members charged with this responsibility. In 1991, ILQCP staff issued penalties to seven violators of the program.

Changes and Additions to the ILQCP in 1991

The MTRCA is committed to the ongoing improvement of the ILQCP and to that end a number of changes and improvements were made to the program in 1991.

Throughout the course of the year, ILQCP staff members took on more and more responsibility for monitoring and assessing the quality of "rubble" material used at lakefill sites. "Rubble" material, such as brick, concrete, stone and asphalt are generally not subjected to the same approvals procedures as soil material. Except in some specific cases, generators of rubble have not been required to test their material before it is lakefilled and haulers of rubble have not been required to submit bills of lading in order to gain entrance to lakefill sites. Under normal lakefill site operations procedures, rubble quality is assessed by inspection at the entrance to the lakefill sites. This inspection has traditionally been carried out by the lakefill site staff themselves with the ILQCP staff being consulted in cases in question. In 1991, however, ILQCP staff took a much more active role in inspecting rubble as it entered sites and in recommending penalties to haulers who deposited rubble with visible contamination and/or refuse. ILQCP staff also began performing routine audits of lakefill site operators rubble approval procedures. The MTRCA believes that ensuring acceptable rubble quality and appearance is an essential function of the ILQCP.

Perhaps the most exciting addition to the ILQCP in 1991 was the purchase of the MicroTip MP100 photoionization detector, a device which detects trace levels of volatile organic compounds in soil and air. The MicroTip (TIP) is able to detect over 400 volatile organic compounds many of which are hazardous and/or indicators of potential environmental concerns. The MTRCA firmly believes that "real time" instruments such as the TIP are effective methods for simultaneously ensuring environmental suitability of materials and doing so in an efficient way so as to reduce negative economic pressures on development.

To date, the TIP instrument has been subjected to an extensive calibration procedure which is not yet complete. The instrument must be calibrated so that we can obtain a reliable part per million number of volatile organic compounds which would indicate rejection of a soil carrying vehicle from a lakefill site. There are no current parameters for usage of this instrument in this manner and hence the Authority is essentially pioneering research into the effectiveness of the TIP as a diagnostic soil quality approval procedure.

While TIP readings have not yet been used to reject truck loads at the entrance to lakefill sites, the instrument has proven to be an invaluable tool in providing staff with indications of potential problems at lakefill generating excavation sites. On numerous occasions in 1991, a relatively high TIP reading has precipitated a site inspection whereby MTRCA concerns over fill quality have been delivered. Staff will continue with the calibration procedures in 1992. The Phase I TIP Calibration Report is appended to this report.

As is the case each year, ILQCP staff continued to modify requirements for successful environmental reports. 1991 was the third year for the ILQCP and we believe that the soils consulting industry has vastly improved the quality and accuracy of their reports over those three years. The strong effort by consultants is due largely to increasing MTRCA demands for quality reports and to numerous cases of the MTRCA rejecting environmental reports (often submitted to us at the eleventh hour) because they were insufficient in some manner.

Results of the Chemical Test Audit for 1991

Table 2 (pg. 8) and Appendix III contain all the results of the ILQCP 1991 Chemical Test Audit. What these figures show is that the results generally agree with the results from 1990 which were in turn better than the results from 1989.

It is no surprise that the results from 1989 have been improved upon over the last two years. In 1989, the program was in its year of inception and all parties concerned were engaged in a rapid learning process. The ILQCP staff were learning what to require in environmental reports and how to interpret test results while the consultants and contractors were busy learning the procedures and protocol associated with the new program. Also in 1989, there was a great amount of fill material deposited at lakefill sites which had not been chemically analyzed. This occurred because excavation projects which were hauling to lakefill sites prior to 1989 were allowed to continue to do so even without testing as part of the ILQCP phase in strategy. By 1990, most, if not all of these projects were completed and all material being accepted had been tested and had received prior approval from the ILQCP staff.

Gradually, over the course of the first three years, the ILQCP has moved toward accepting only native material from large excavation sites downtown. It has been found that, in the great majority of cases, material from downtown that had made up a previously backfilled layer was unacceptable for open water disposal and often unacceptable for confined disposal. When the Toronto Harbour Commissioners eliminated the confined disposal option at the Leslie St. Spit in 1989, it effectively meant that very little surficial fill material from the downtown area would be lakefilled. Our audit results in 1990 and 1991 show that the ILQCP is approximately 85% efficient for large sites, most of which are carrying deep native material from excavation sites downtown. It is important here to recognize that the overall levels of lakefill parameters in downtown native material are very close to the open water lakefill guidelines. Since the guideline is so close to the normal levels of the respective parameters it is not unusual to find that 15% of the samples taken exceed the guidelines. In the vast majority of cases the exceedances are minor in nature. In addition, ILQCP staff have found that a disproportionate number of samples found to exceed the open water guidelines from large projects have been obtained from roadbed and roadway excavations. Greater scrutiny of test results from these types of excavations will take place in 1992.

Other ILQCP Statistics

As is eminently clear from statistics in Table 1 (pg. 7), the overall volume of lakefilled material in 1991 was down substantially from the 1990 totals. It is believed that the lack of construction in the downtown area was the most significant reason for this reduction in lakefilling. It is important to note that these statistics are based on an estimated 10 cu. m per truck load entering the site and, as such, are approximate.

According to our statistics, fill volumes were down 77.5% in 1991 from 1990. At the same time, the volume of material rejected by either reviewing the test results or by inspection, was down by only 55 percent from 1990. Thus in 1991, 20.1% of all material that was applying for lakefill acceptance was rejected. This figure only represents the amount of material that was rejected by ILQCP staff and does not include the potentially large amount of fill rejected after the testing stage, or even after the site history stage, by soils consultants, property owners or contractors. In these cases the MTRCA would not have even been notified of the project and hence cannot include these statistics with their own.

The following pie graph (Graph 1) illustrates the relative proportions of lakefill material from large sites and small sites and also by disposal area. Once again, in 1991, the vast majority of soil lakefilled was generated from large sites which, by definition in The Manual for an Improved Lakefill Quality Control Program, must be chemically tested and subjected to an environmental soils audit prior to MTRCA approval. The graph also points out that the vast majority of large site material received at lakefill sites is of open water quality.

Graph 1: Proportion of Soil Lakefilled by Soil Quality Classification and Project Size

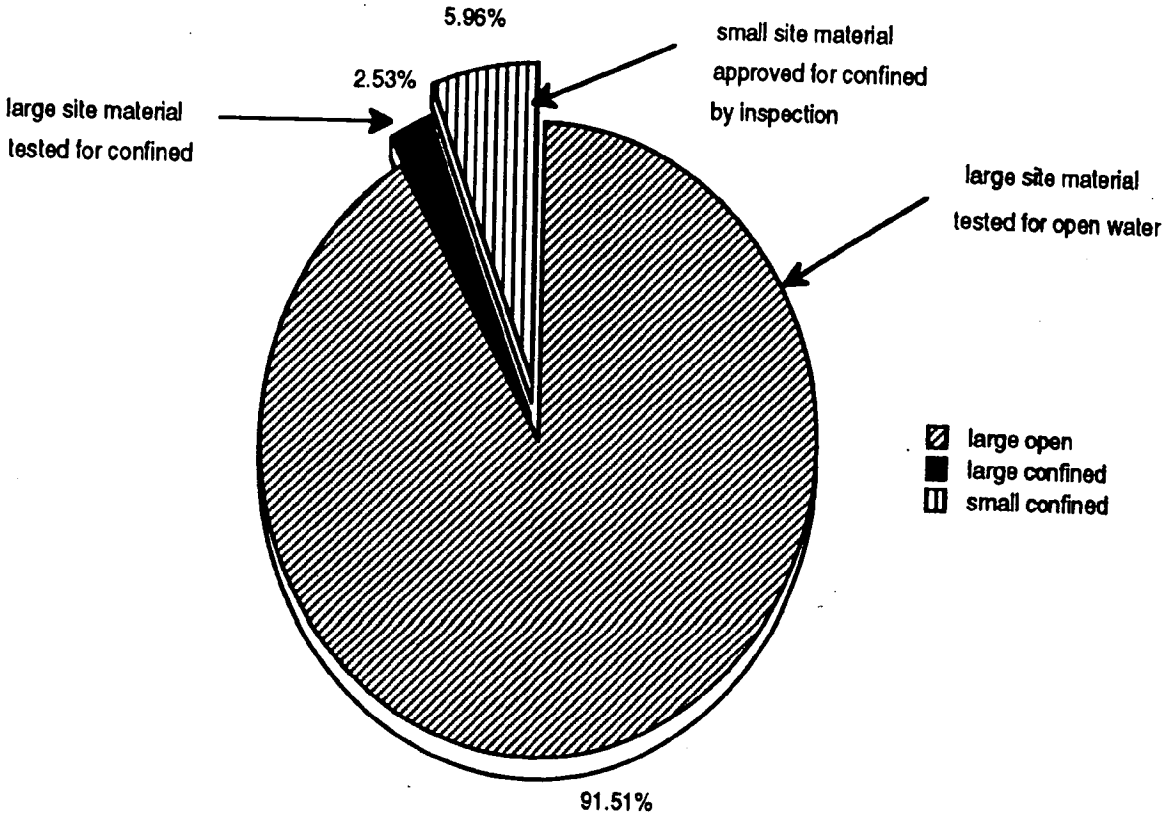


TABLE 1 1990 - 1991 STATISTICAL COMPARISON

Category volumes in m^3	1989	1990	1991	Explanation
total volume of fill received	1,363,550	1,052,040	237,600	
total volume of fill received from large sites	1,145,370	1,032,860	223,440	
total volume of fill received from small sites	218,180	19,180	14,160	
percentage of total which originated from large sites	84.00	98.18	94	
percentage of total which originated from small sites	16.00	1.82	6.0	
volume of material rejected	682,490	132,990	59,850	
$\frac{\text{vol rejected}}{\text{vol. received + volume rejected}}$	33.3	11.2	20.1	This figure represents an approximate percentage of the total volume of fill applied for that was rejected.
volume of open water quality fill material received	1,040,790	1,016,760	217,420	
volume of protected quality fill material received	317,640	5,730	0	The protected category no longer exists. As of spring 1990, all tested soil exceeding the OWG but passing the RLUG has been designated as "confined" and has been deposited on land at the various lakefill sites.
volume of confined quality fill material received	4,510	29,550	20,180	
total number of large site applicants	189	96	120	
total number of bills issued to large sites	247,622	48,659	36,929	
difference between bills received and bills issued (large sites)	-133,085	+54,627	-14,585	"+" more bills received than issued "-" more bills issued than received
number of violations	30	9	7	

1989 - 1991 COMPARISON OF CHEMICAL TEST AUDIT RESULTS

TABLE 2

Category volumes in m^3	1989	1990	1991	Explanation
total number of samples tested	135	156	109	Since the ILQCP is funded soley on revenue generated from tipping fees, the large decrease in lakefill volumes in1991 necessitated a reduction in the number of soil samples tested.
total number of samples taken from trucks originating from large sites	32	107	91	
number of samples failing OWG against the expectations of the original environmental report	8	16	14	
number of samples failing RLUG against the expectations of the original environmental report	2	0	2	
percentage of samples exceeding expectations of the original environmental reports	25	15	16.5	Therefore the ILQCP was, 75% efficient for large projects in 1989, 85% efficient for large projects in 1990 and 83.5% efficient for large sites in 1991.
total number of samples taken from trucks originating from small sites	88	49	18	
number of small site samples failing the OWG.	45	12	4	Passing the OWG is not a criteria for small sites since all small site loads are deposited on land in "confined" areas. This information can be helpful, however, in grading the quality of material that ILQCP staff approve via site inspection.
number of small site samples failing the RLUG against the expectations of the ILQCP.	6	1	1	
percentage of samples exceeding expections for small projects	6.8	2.0	5.5	Therefore the ILQCP was 93.2% efficient for small sites in 1989, 98% efficient for small sites in 1990 and 94.5% efficient for small sites in 1991.

C) The Lakefill Sites

Leslie Street Spit

The Leslie St. Spit is a large peninsula of land jutting out into Lake Ontario from the bottom of Leslie St. in the city of Toronto. The Leslie St. Spit is the land form which defines Toronto's Outer Harbour and it is partially owned by The Metropolitan Toronto and Region Conservation Authority who operate their portion as Tommy Thompson Park.

In 1991, all soil material deposited at the Leslie St. Spit was classified as "open water quality " with the majority being deposited at the headland. The portion of the Spit which received earth fill in 1991 is owned by the Province of Ontario and leased and operated by the Toronto Harbour Commissioners.

Col. Sam Smith Park

Col. Sam Smith Park is a waterfront development project owned and operated by the MTRCA. Col. Sam Smith Park will provide parkland and marina space when completed. Approximately 90% of the fill deposited at Col. Sam Smith in 1991 was placed on land and not in the open water.

Guildwood Parkway

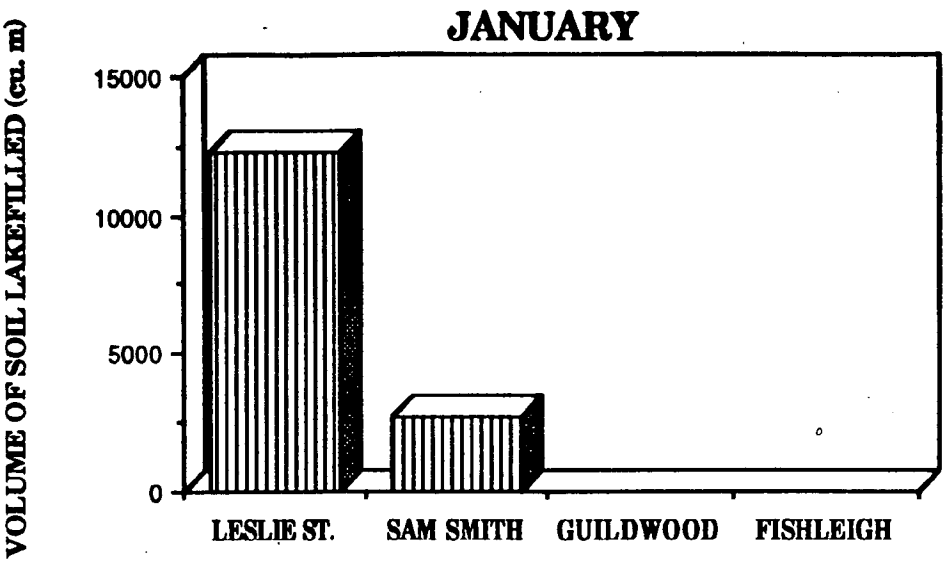
The term "Guildwood Parkway " as used by the Improved Lakefill Quality Control Program actually refers to a number of shoreline management projects being undertaken by the MTRCA along the Scarborough Bluffs. These projects create revetments along the base of the bluffs in order to stabilize the bluff face to keep it from eroding. These revetments will also provide greenspace along the waterfront.

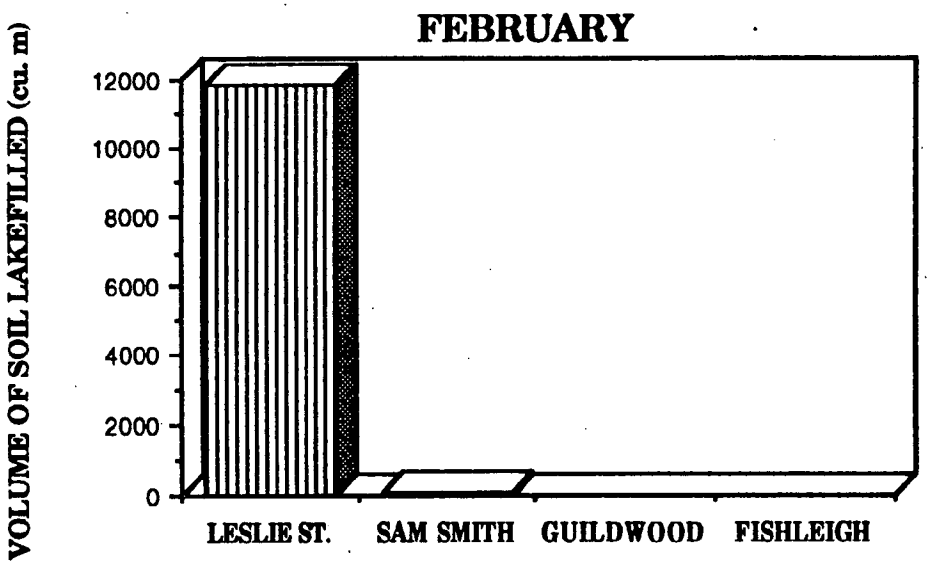
Fishleigh

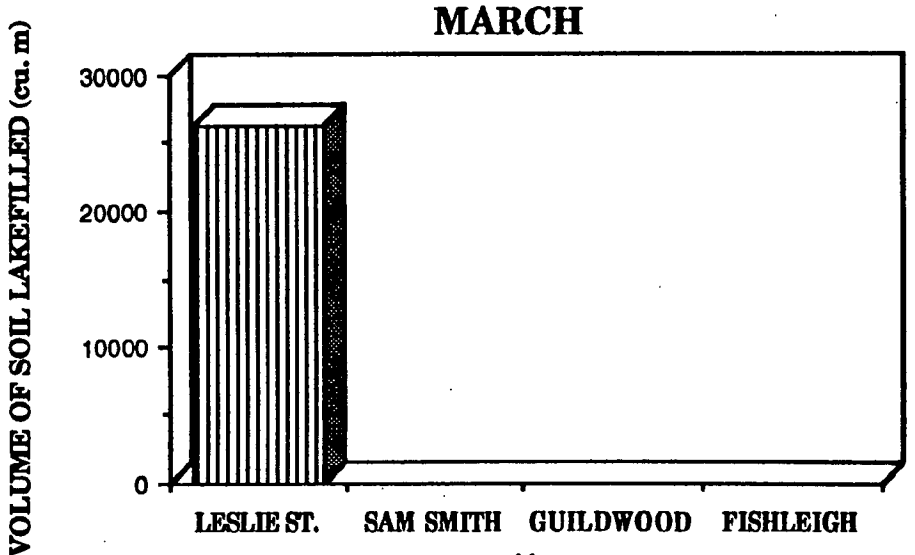
Like the Guildwood Parkway sites, The Fishleigh lakefill site is a revetment being created by the MTRCA to protect against bluff erosion.

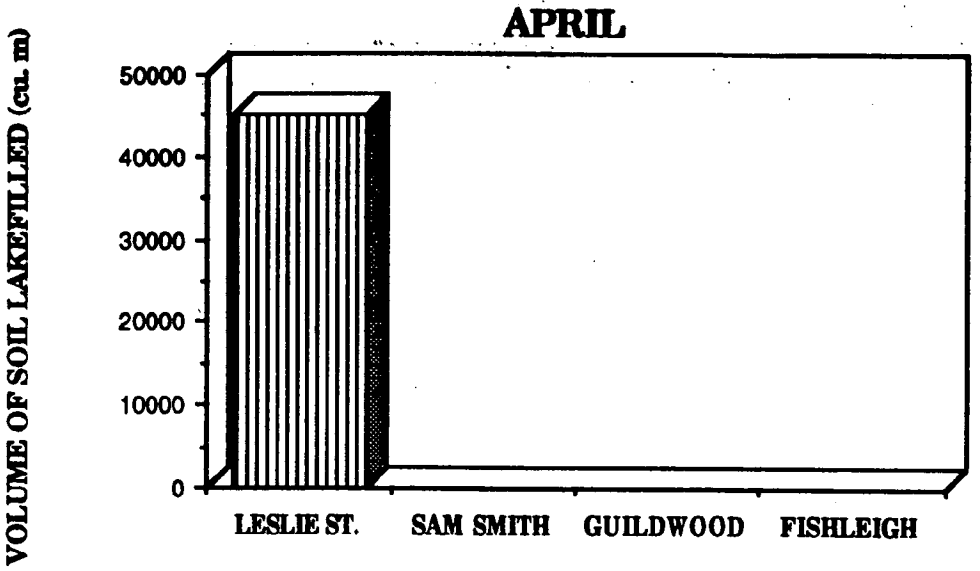
APPENDIX 1

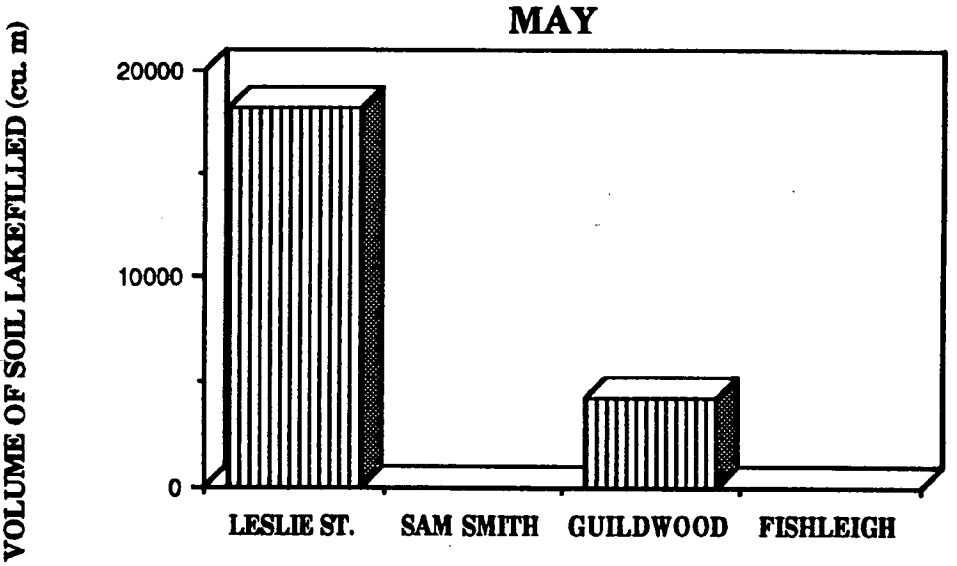
Monthly Breakdown of Total Fill Volumes Received at Each Fill Site

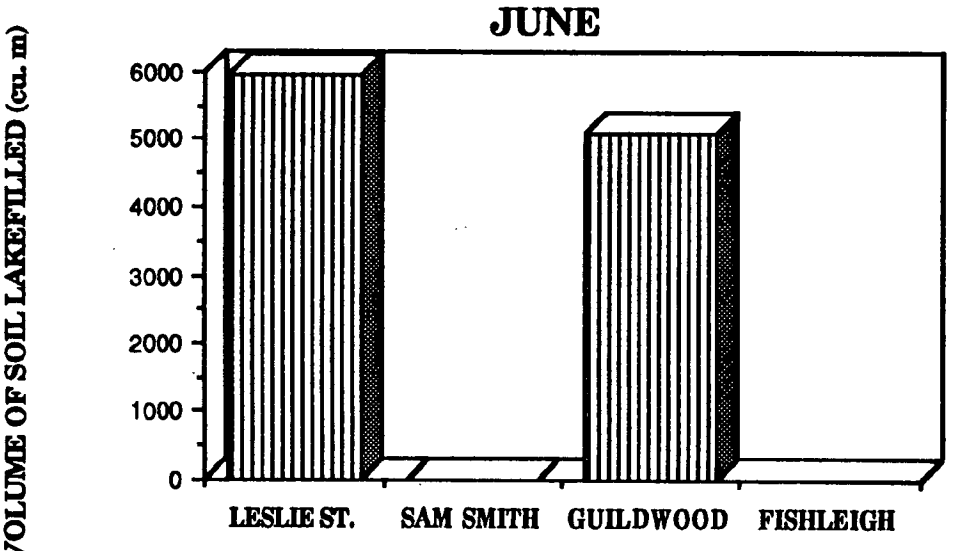

JANUARY
VOLUME OF SOIL LAKEFILLED (cu. m)
15000
10000
5000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

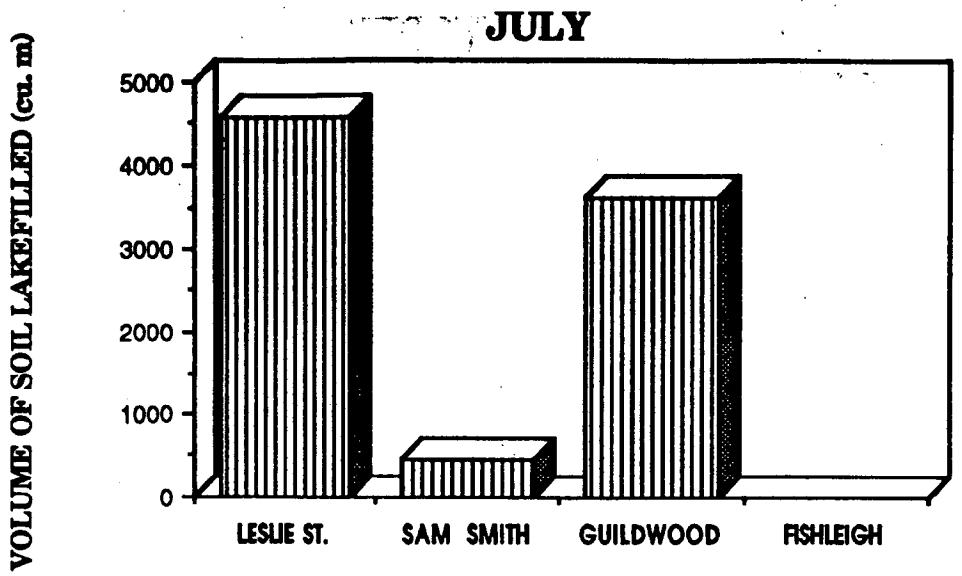

FEBRUARY
VOLUME OF SOIL LAKEFILLED (cu. m)
12000
10000
8000
6000
4000
2000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

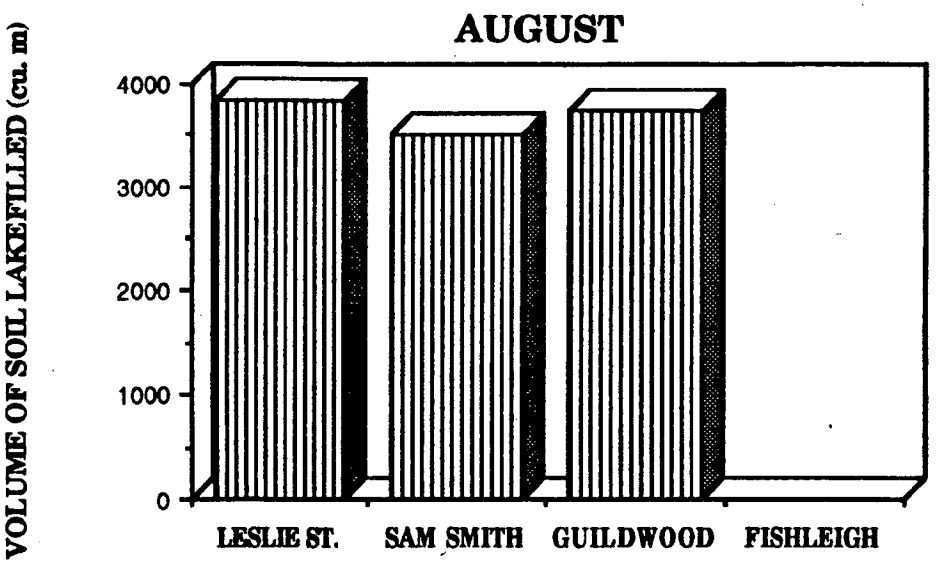

MARCH
VOLUME OF SOIL LAKEFILLED (cu. m)
30000
20000
10000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

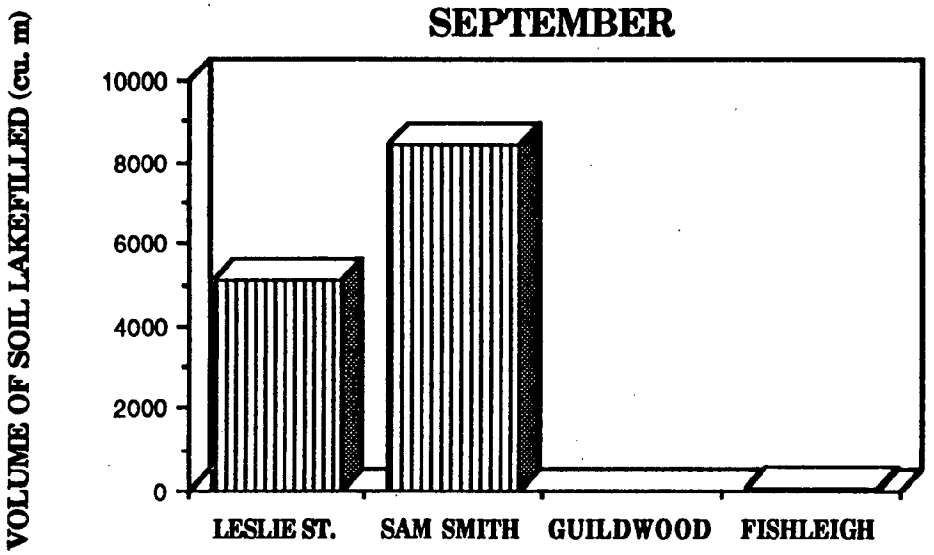

APRIL
VOLUME OF SOIL LAKEFILLED (cu. m)
50000
40000
30000
20000
10000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

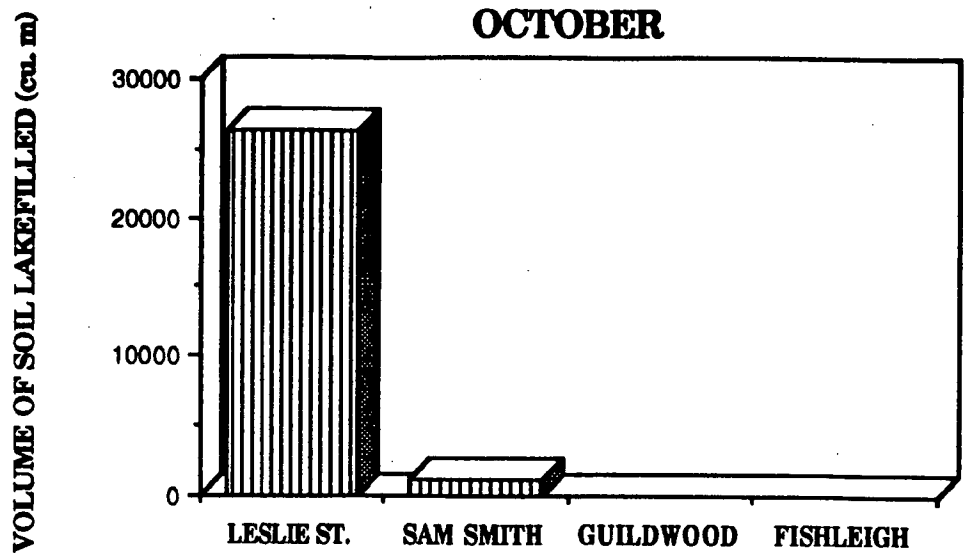

MAY
VOLUME OF SOIL LAKEFILLED (cu. m)
20000
10000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

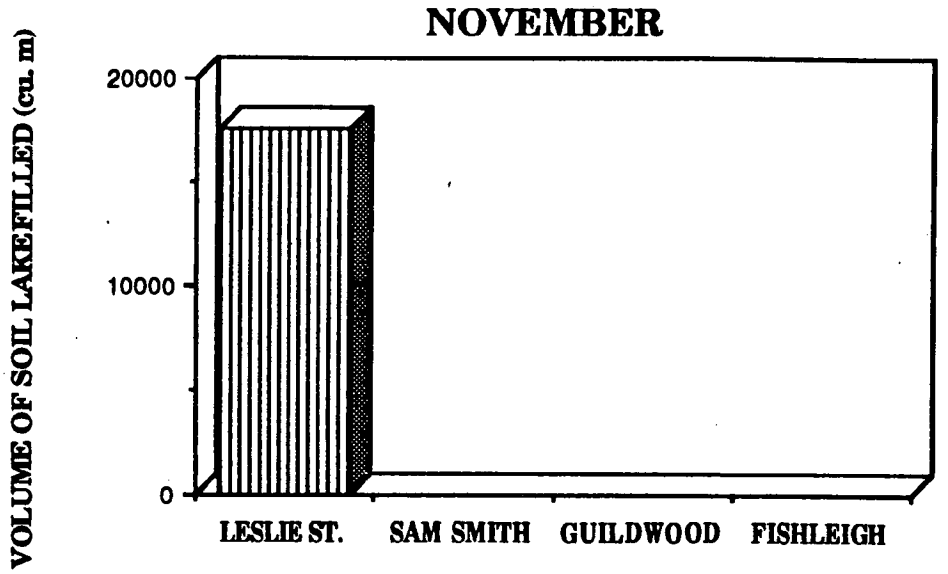

JUNE
VOLUME OF SOIL LAKEFILLED (cu. m)
6000
5000
4000
3000
2000
1000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

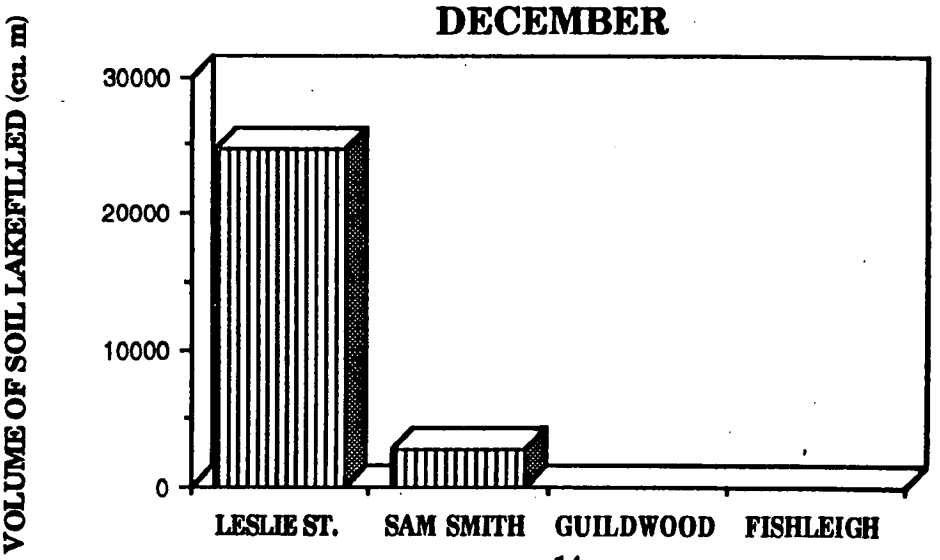

JULY
VOLUME OF SOIL LAKEFILLED (cu. m)
5000
4000
3000
2000
1000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH


AUGUST
VOLUME OF SOIL LAKEFILLED (cu. m)
4000
3000
2000
1000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH


SEPTEMBER
VOLUME OF SOIL LAKEFILLED (cu. m)
10000
8000
6000
4000
2000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

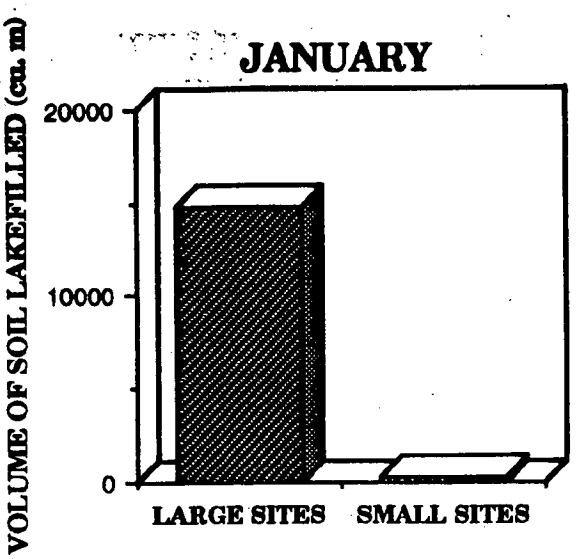

OCTOBER
VOLUME OF SOIL LAKEFILLED (cu. m)
30000
20000
10000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

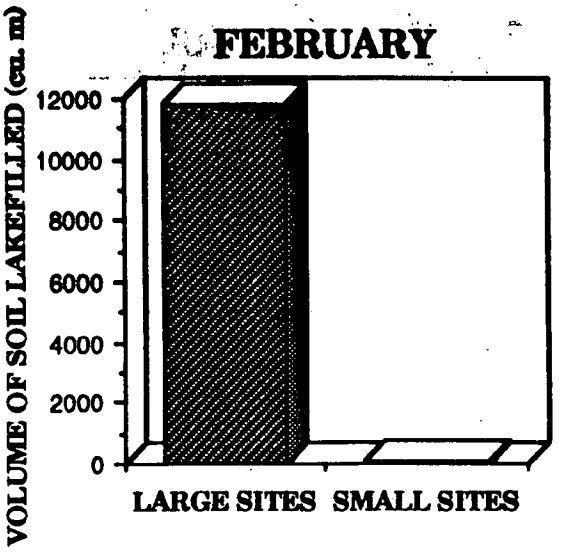

NOVEMBER
VOLUME OF SOIL LAKEFILLED (cu. m)
20000
10000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

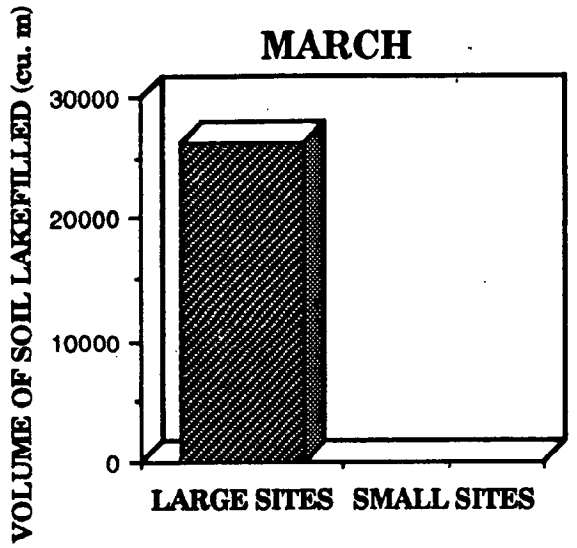

DECEMBER
VOLUME OF SOIL LAKEFILLED (cu. m)
30000
20000
10000
0
LESLIE ST.
SAM SMITH
GUILDWOOD
FISHLEIGH

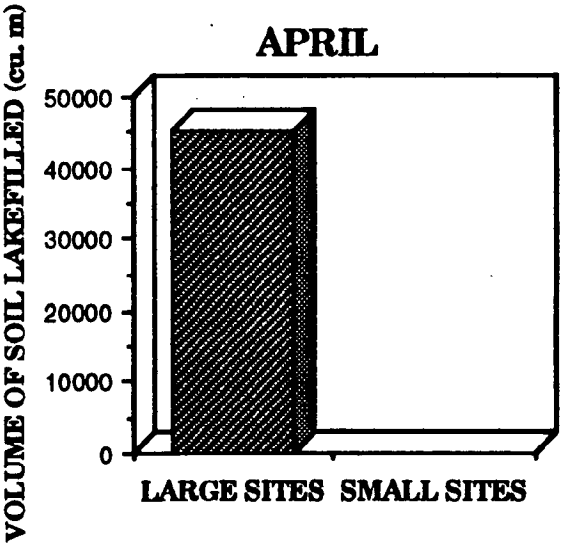
APPENDIX 2

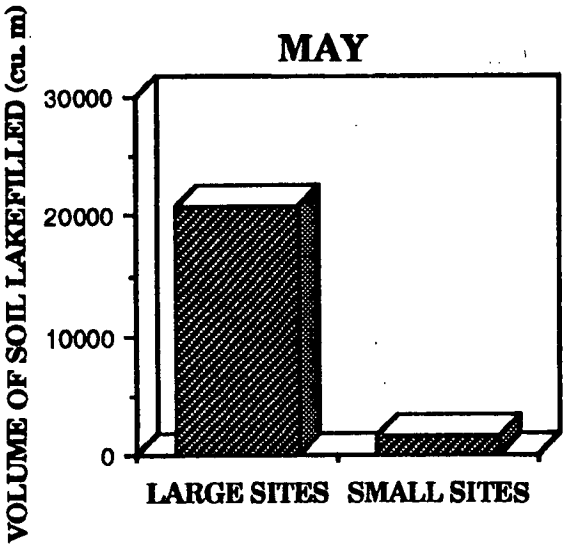
Monthly Breakdown of Fill Volumes Received from "Large Sites " and "Small Sites "

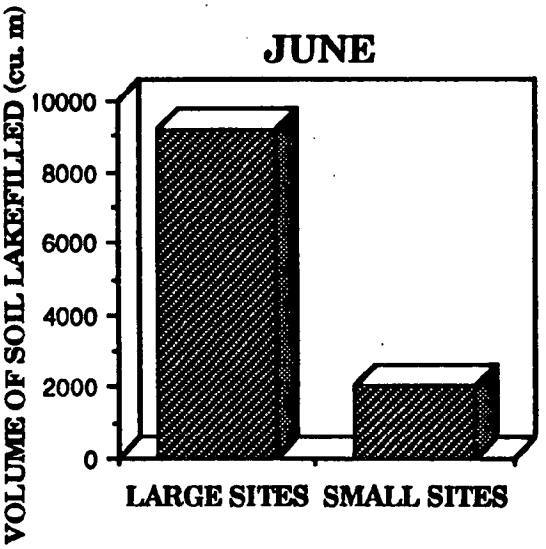

JANUARY
VOLUME OF SOIL LAKEFILLED (cu. m)
20000
10000
0
LARGE SITES
SMALL SITES

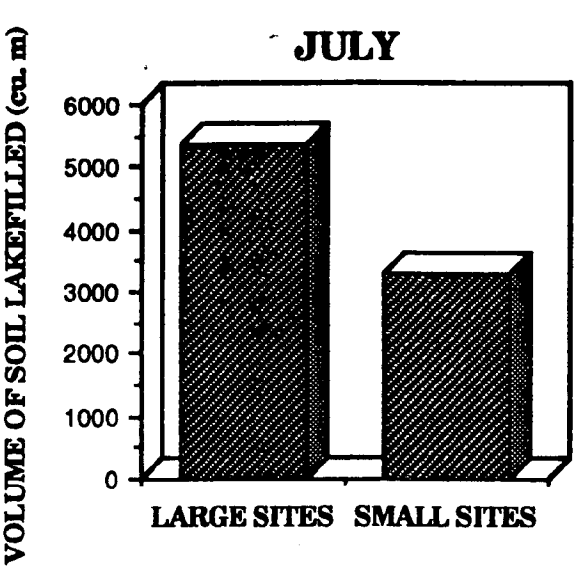

FEBRUARY
VOLUME OF SOIL LAKEFILLED (cu. m)
12000
10000
8000
6000
4000
2000
0
LARGE SITES
SMALL SITES

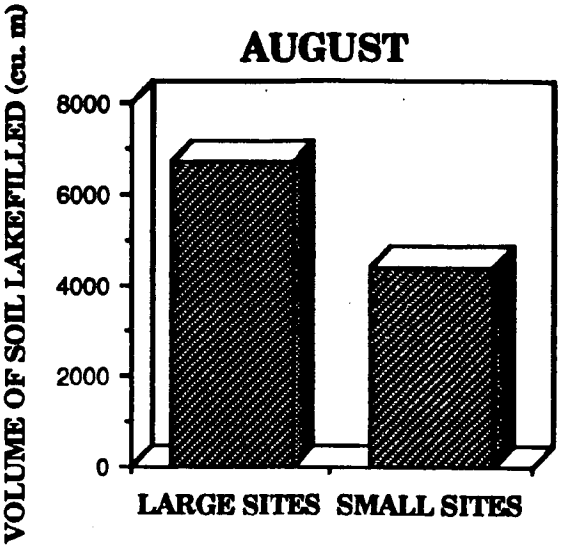

MARCH
VOLUME OF SOIL LAKEFILLED (cu. m)
30000
20000
10000
0
LARGE SITES
SMALL SITES

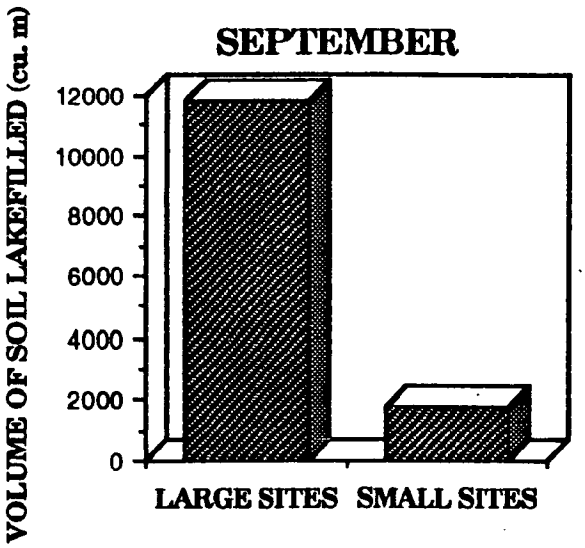

APRIL
VOLUME OF SOIL LAKEFILLED (cu. m)
50000
40000
30000
20000
10000
0
LARGE SITES
SMALL SITES

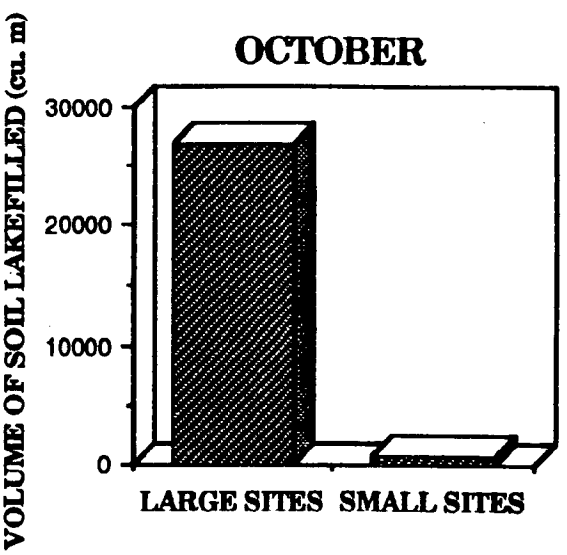

MAY
VOLUME OF SOIL LAKEFILLED (cu. m)
30000
20000
10000
0
LARGE SITES
SMALL SITES

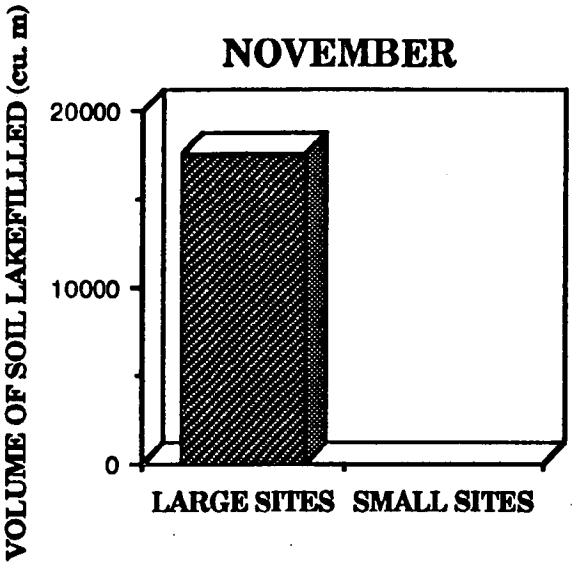

JUNE
VOLUME OF SOIL LAKEFILLED (cu. m)
10000
8000
6000
4000
2000
0
LARGE SITES
SMALL SITES

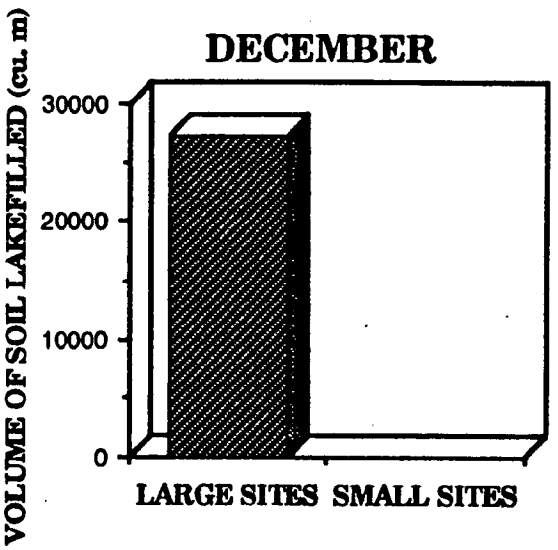

JULY
VOLUME OF SOIL LAKEFILLED (cu. m)
6000
5000
4000
3000
2000
1000
0
LARGE SITES
SMALL SITES


AUGUST
VOLUME OF SOIL LAKEFILLED (cu. m)
8000
6000
4000
2000
0
LARGE SITES
SMALL SITES


SEPTEMBER
VOLUME OF SOIL LAKEFILLED (cu. m)
12000
10000
8000
6000
4000
2000
0
LARGE SITES
SMALL SITES


OCTOBER
VOLUME OF SOIL LAKEFILLED (cu. m)
30000
20000
10000
0
LARGE SITES
SMALL SITES

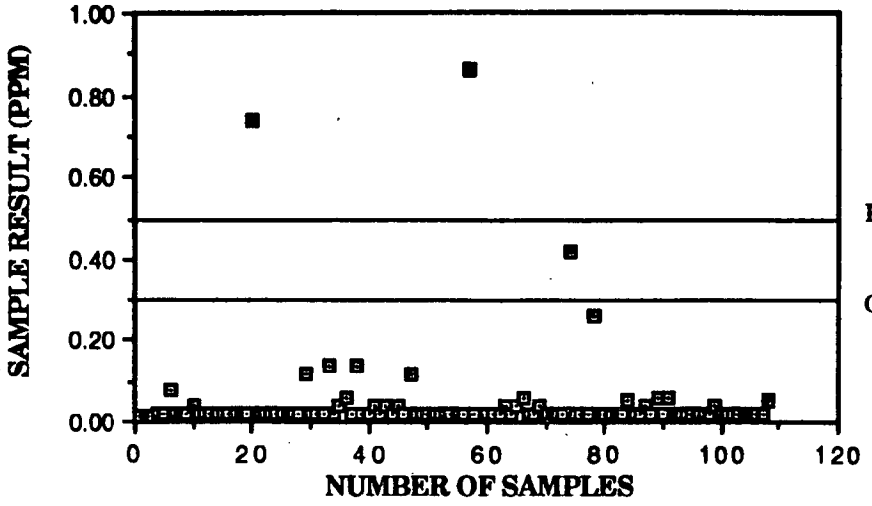

NOVEMBER
VOLUME OF SOIL LAKEFILLED (cu. m)
20000
10000
0
LARGE SITES
SMALL SITES


DECEMBER
VOLUME OF SOIL LAKEFILLED (cu. m)
30000
20000
10000
0
LARGE SITES
SMALL SITES

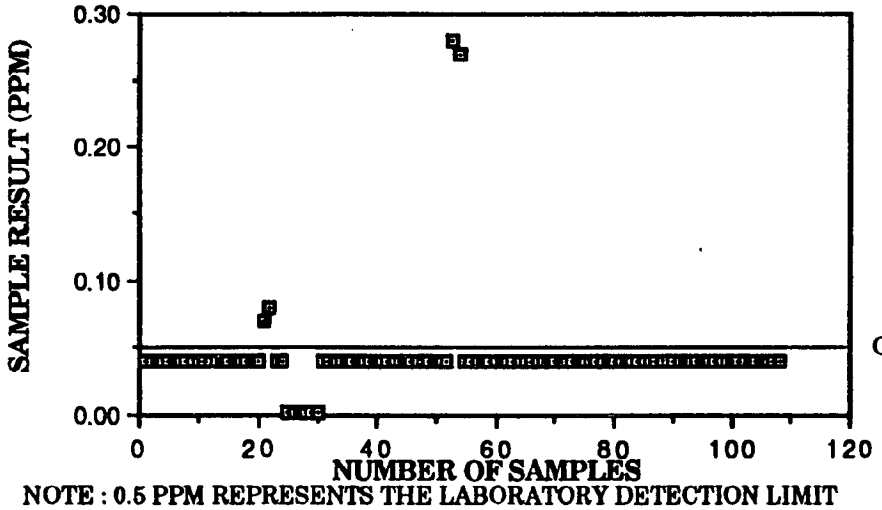
APPENDIX 3

Results of the ILQCP Internal Chemical Analysis Auditing System

MERCURY

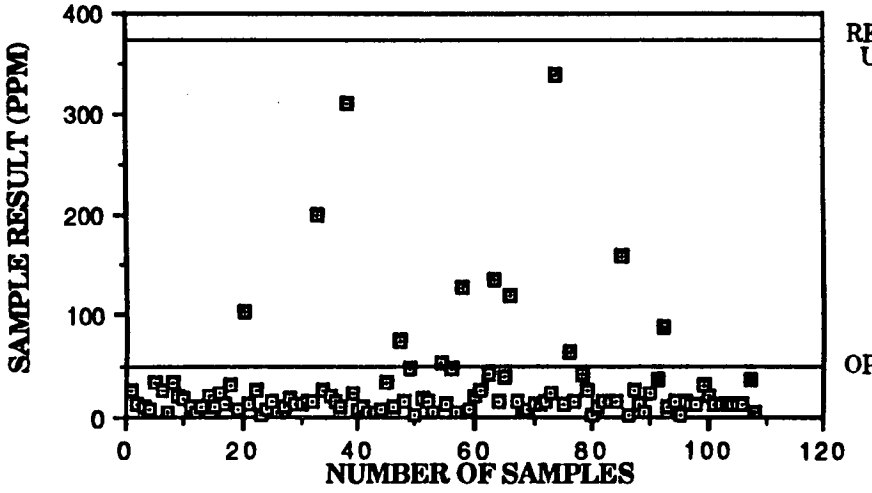


PCB

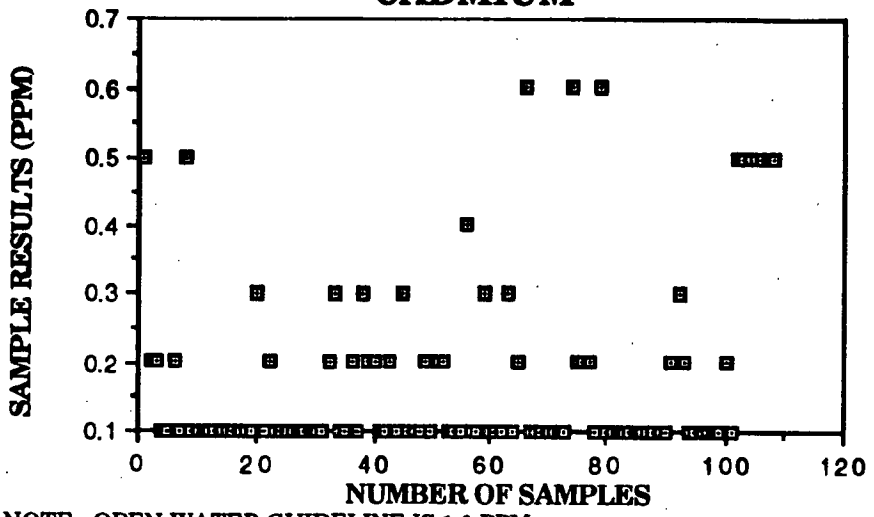


NOTE : 0.5 PPM REPRESENTS THE LABORATORY DETECTION LIMIT
THE RESTRICTED LAND USE GUIDELINE FOR PCB'S IS 2.0 PPM

LEAD

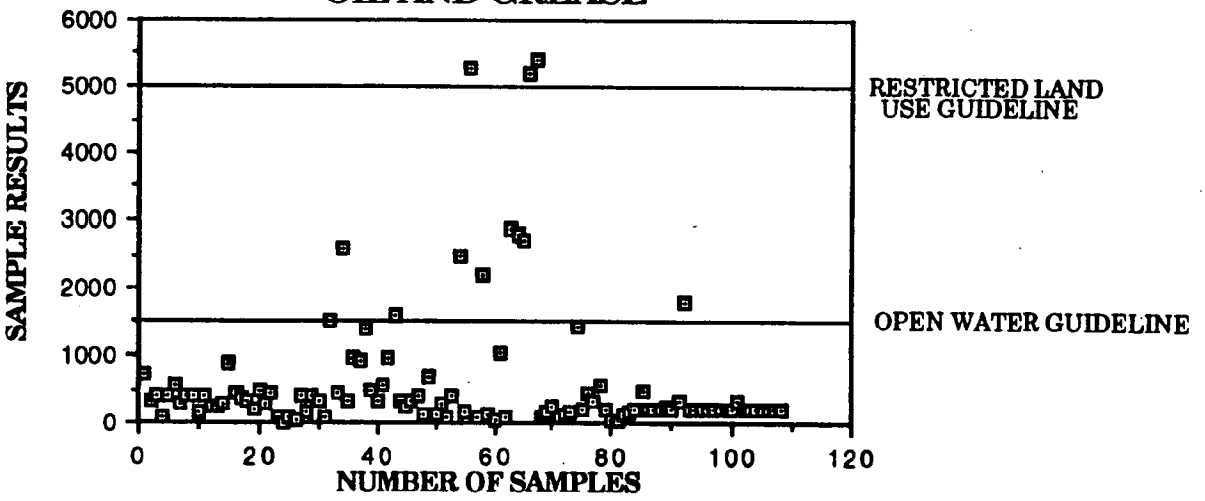


CADMIUM

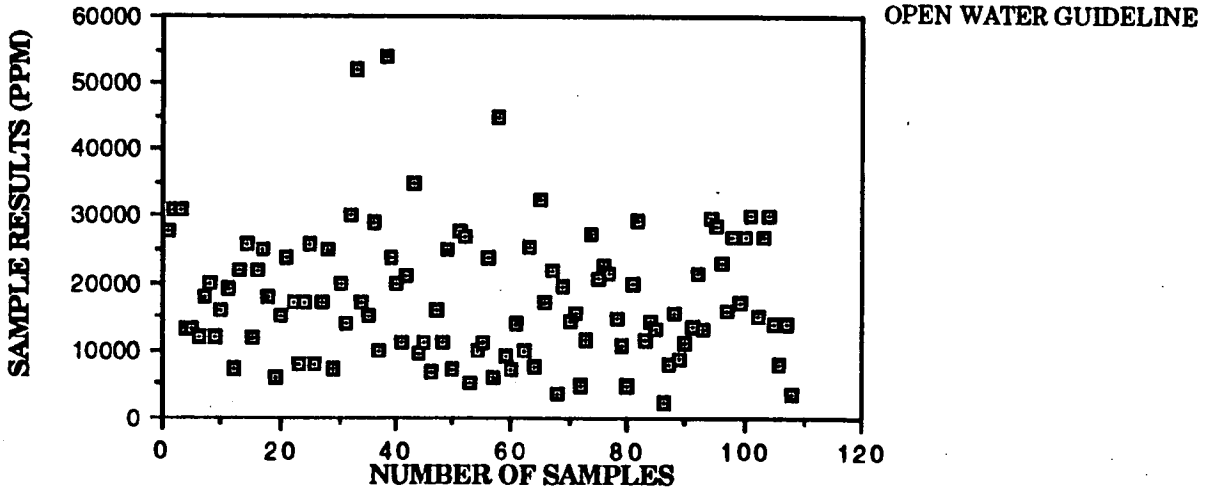


NOTE : OPEN WATER GUIDELINE IS 1.0 PPM
THE RESTRICTED LAND USE GUIDELINE FOR CADMIUM IS 3.0 PPM

OIL AND GREASE

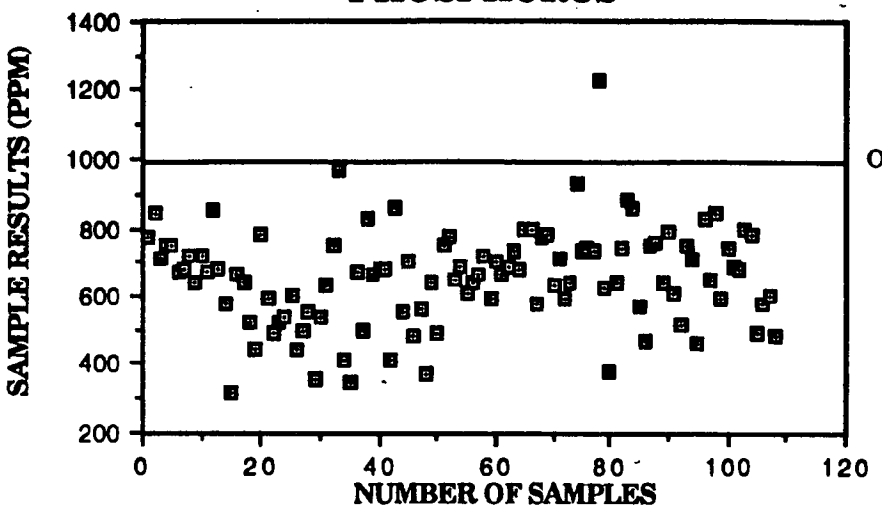


VOLATILE SOLIDS



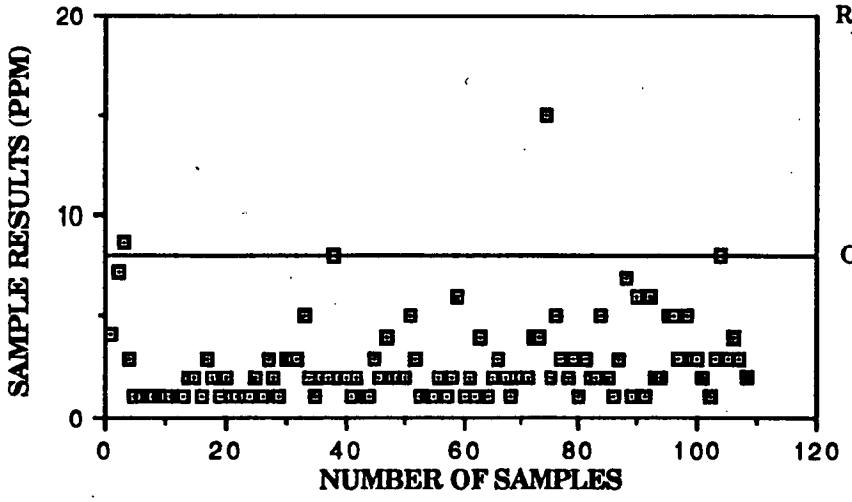
NOTE : VOLATILE SOLIDS IS NOT LISTED ON THE RESTRICTED LAND USE GUIDELINE

PHOSPHORUS

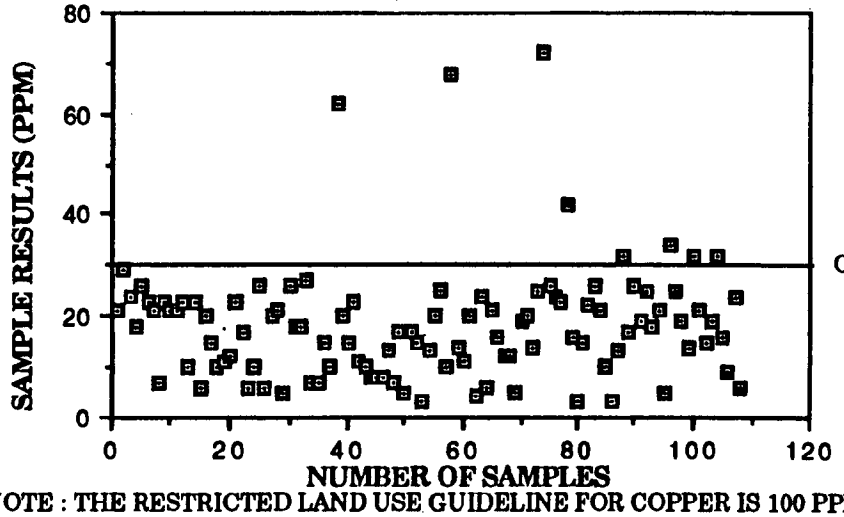


NOTE : PHOSPHORUS IS NOT LISTED ON THE RESTRICTED LAND USE GUIDELINES

ARSENIC

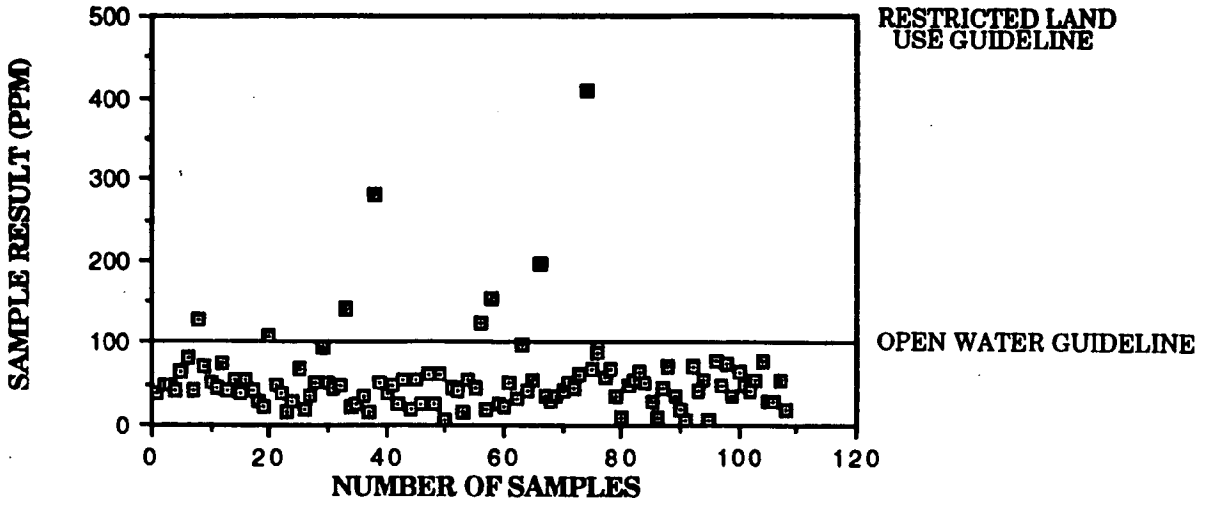


COPPER

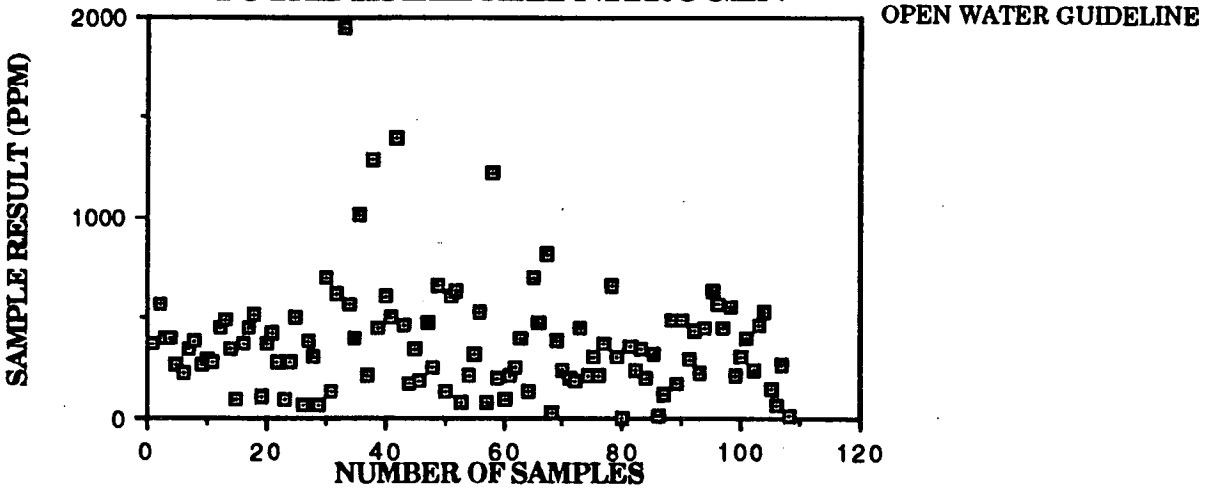


NOTE : THE RESTRICTED LAND USE GUIDELINE FOR COPPER IS 100 PPM

ZINC

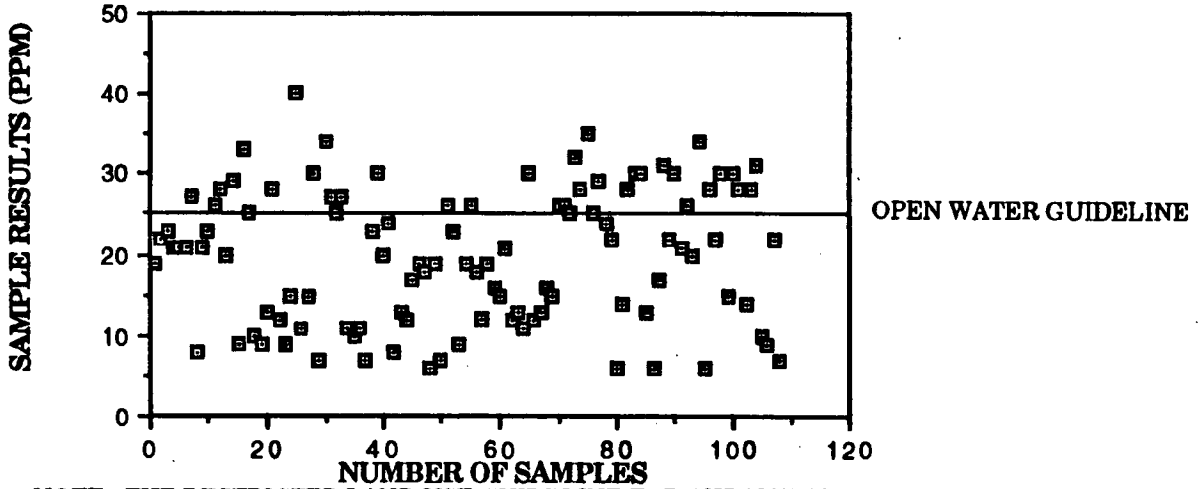


TOTAL KJELDAHL NITROGEN



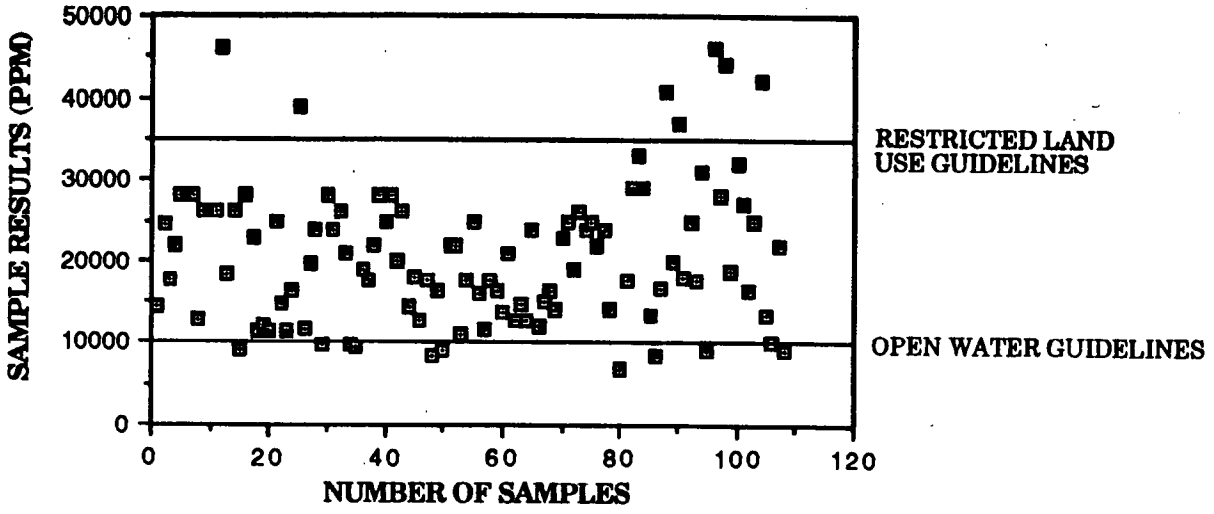
NOTE : TKN IS NOT LISTED ON THE RESTRICTED LAND USE GUIDELINE

CHROMIUM

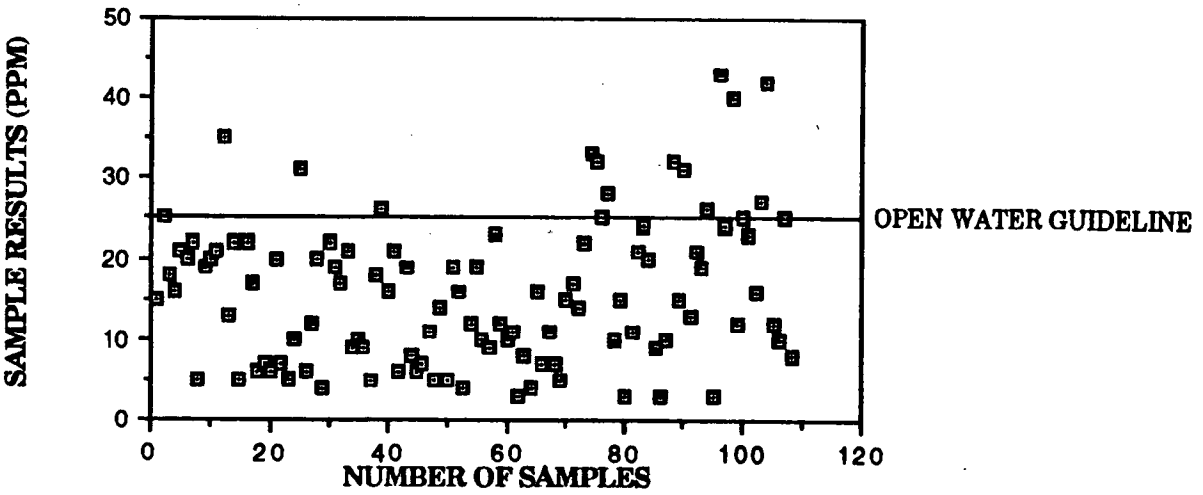


NOTE : THE RESTRICTED LAND USE GUIDELINE FOR CHROMIUM IS 120 PPM

IRON

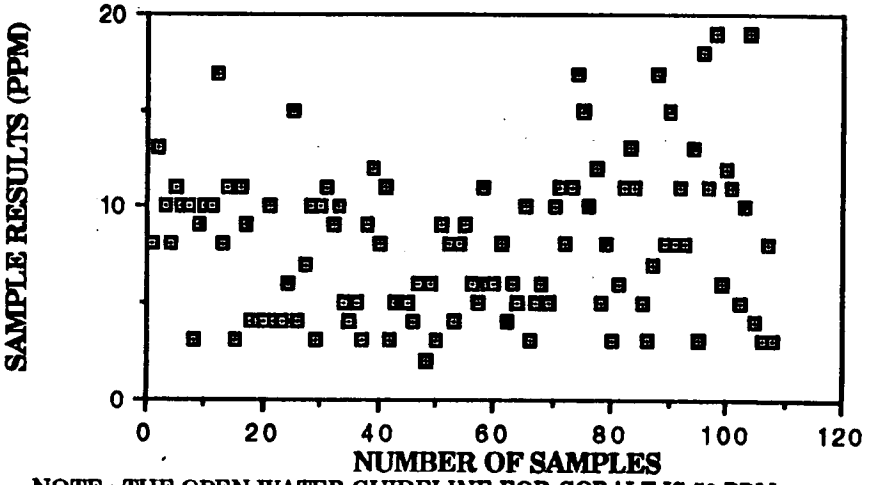


NICKEL



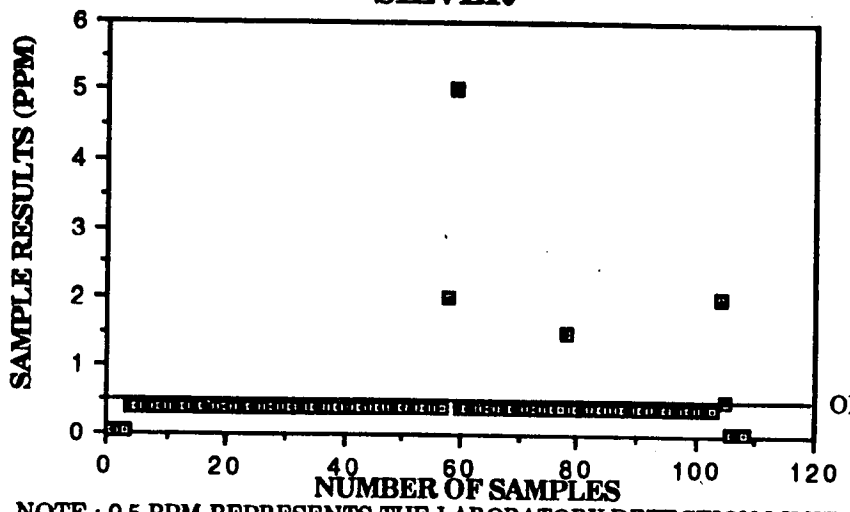
NOTE : RESTRICTED LAND USE GUIDELINE FOR NICKEL IS 60 PPM

COBALT



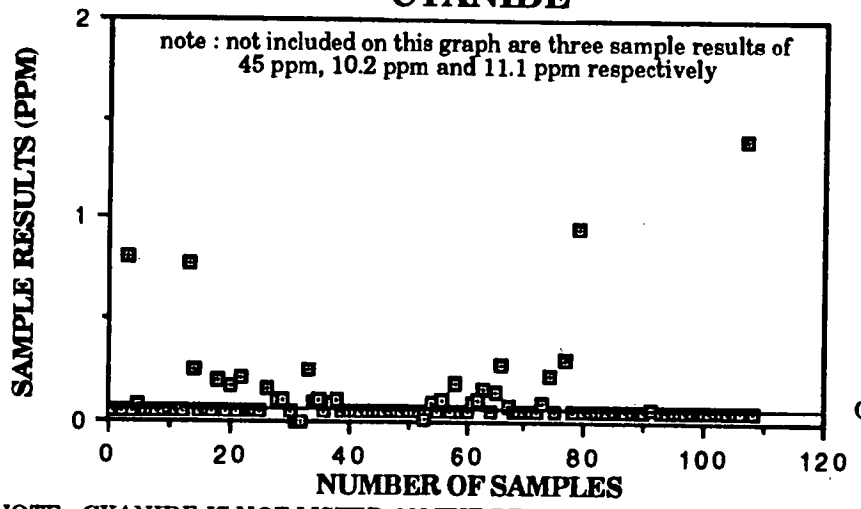
NOTE : THE OPEN WATER GUIDELINE FOR COBALT IS 50 PPM
THE RESTRICTED LAND USE GUIDELINE FOR COBALT IS 25 PPM

SILVER



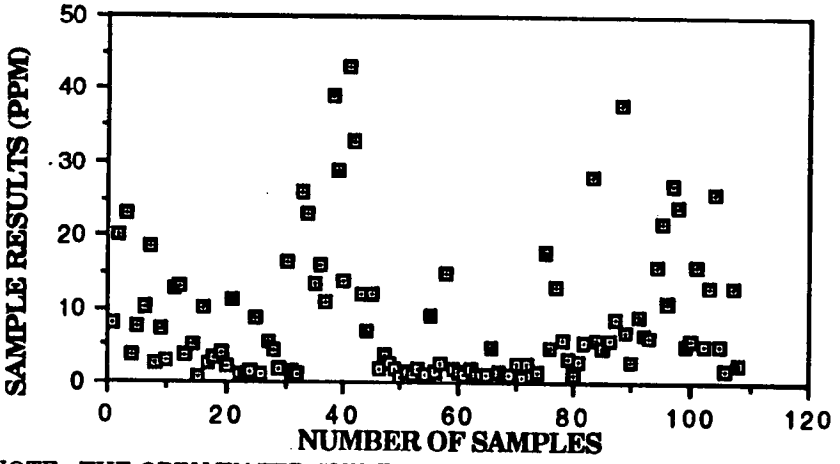
NOTE : 0.5 PPM REPRESENTS THE LABORATORY DETECTION LIMIT
SILVER IS NOT LISTED ON THE RESTRICTED LAND USE GUIDELINES

CYANIDE



NOTE : CYANIDE IS NOT LISTED ON THE RESTRICTED LAND USE GUIDELINE

AMMONIA



NOTE : THE OPEN WATER GUIDELINE FOR AMMONIA IS 100 PPM
AMMONIA IS NOT LISTED ON THE RESTRICTED LAND USE GUIDELINE

APPENDIX 4

Phase I report on MicroTIP Calibration

Phase I Study
MicroTip Organic Vapour Meter Calibration

for:

The Metropolitan Toronto and Region Conservation Authority

December 17, 1991

File: A-13-28

Introduction

In July of 1991, the Improved Lakefill Quality Control Program acquired a MicroTip organic vapour meter. This instrument uses a photoionization detector and operates on the principle of ionization potentials. Briefly, a vacuum pump in the housing of the instrument draws in ambient air whose stream passes an ultra-violet light source of a specific energy level which increases the energy of the electrons surrounding ionizable molecules and causes the electrons to move to an elevated electron orbit. When the molecules are no longer in the presence of the ultra-violet light source, the electrons drop back to their original, more stable orbits, thereby producing an electrical field which is measured by the detector in the vapour meter. The size of the electrical field produced is directly proportional to the ionizable molecule concentration in the air stream.

The initial phase of the MicroTip (or "Tip") study is now complete after four months of sample collection. Phase One was essentially done to approximately define "high " and "low " total concentrations of volatile organic compounds found in soil, primarily, but also in other material types such as fresh and ground asphalt.

A total of one hundred Tip samples were taken as of November 25, 1991. Not all were soil samples. Asphalt, in both fresh and ground form, gravel, and concrete washout were also sampled. Each reading was the highest of all the interval average reading taken during the event, where an interval is defined as being fifteen seconds and an event is a full record of all Tip readings taken during the process of analyzing a sample.

Analysis

Figure 1 displays all Tip results, including the three readings above 1000 ppm. Of these three readings, two were spiked soil samples, while the other was taken from a load of asphalt with some fuel soaked soil mixed in. The result of this reading was that all trucks hauling the asphalt materialfrom that project were not permitted entry into the Leslie St. site. The remaining ninety-seven samples (figure 2) showed very low total concentrations of volatile organic compounds. The most notable statistic was that 81.0% of all samples had concentrations of 5.0 ppm or below (see Table 1).

Before use of the MicroTip had begun, it was agreed that a possible correlation between the Tip readings and lab-derived concentrations for loss on ignition (which tests for volatile solids) and oil and grease be investigated. Such correlations have not been found (see Table 3.)

Soil whose source was identified positively (by the Bill of Lading) rather than that which had already been dumped and could not be positively identified showed excellent results. Of the sixty-eight samples taken, only three had reading above 10 ppm, while five were above 5.0 ppm (see Figures 3 and 4). The Tip readings for ILQCP- approved projects were than subdivided into "open water "

and "confined " categories. "Open water " material, which requires a full environmental report including complete chemical analysis as part of the approval process, produced excellent results (see Table 1 and Figure 5), as 94.0% of the fifty samples taken were less ≤ 10 ppm. "Confined " material, which does not require chemical testing as part of the approval process, showed results almost as impressive as those for "open water " material, despite the smaller sample size (see Table 1 and Figure 6).

During the course of Phase One of the Tip study, it was thought that it would be useful to sample material such as fresh and ground asphalt, gravel, and concrete washout. All of these samples were taken at the Leslie St. site, where no fee is charged for this material. A total of eleven samples were taken, seven of which exceeded 5.0 ppm (see Figure 7 and Table 1). Fresh and ground asphalt comprised eight of the eleven samples and five of these asphalt samples exceed 40.0 ppm (see Figure 8 and Table 1). These five results made up 41.7% of all exceedances above 10.0 ppm. Despite the small sample size, it can be safely stated that fresh asphalt and asphalt grindings are major sources of volatile organic compounds.

Further Study

Phase Two of the Tip calibration will involve attempting to establish a relationship between measured soil contaminant concentration using the Tip and the actual soil contaminant concentration for four common soil contaminants containing volatile organic compounds : gasoline, diesel fuel, trichloroethylene, and tetrachloroethylene. Once the correlation curves are produced, we can evaluate the Tip results obtained from ongoing tests of material at our lakefill sites and possibly set a guideline concentration for total volatile organics. This guideline could serve as an additional set of criteria by which we approve material, particularly that destined for "confined" disposal at our sites.

Table 1 : Concentration Breakdown of Tip Results

Category	No. of Samples	% with [ ] ≤ 5.0 ppm	% with [ ] ≤ 10.0 ppm
All Tip Results	100	81.0	85.0
ILQCP Approved Soil	68	86.8	92.6
Fresh and Ground Asphalt, Gravel, Concrete Washout	11	36.4	36.4
Fresh and Ground Asphalt	8	37.5	37.5
ILQCP "Open Water " Material	50	88.0	94.0
ILQCP "Confined " Material	18	83.3	88.9

The eight samples of fresh and ground asphalt are a subset of the eleven samples of fresh and ground asphalt, gravel, and concrete washout. These samples added to the sixty-eight samples from ILQCP- approved soil gives seventy-nine samples. The remaining twenty-one samples not categorized consisted of soil which could not be positively identified by a Bill of Lading because they had already been dumped, and spiked samples.

Table 2 : Average and Median Values

Category	Average (ppm)	Median (ppm)
All Tip Results	50.4	1.2
* All Tip Results	7.4	1.1
**ILQCP Approved Soil	4.6	0.9
ILQCP Approved Soil	1.6	0.8
Fresh and Ground Asphalt, Gravel, and Concrete Washout	33.8	41.4
Fresh and Ground Asphalt	35.0	42.1
ILQCP "Open Water " Material	3.2 *** 1.7	0.9
ILQCP "Confined " Material	8.9 *** 1.7	1.0

* This category does not include the three values > 1000 ppm (1188, 1683, 1453 ppm) which skew the average value from 7.4 ppm to 50.4 ppm and the median from 1.1 ppm to 1.2 ppm.

** This category does not include the three values > 10 ppm (37.8, 63.1, 70.5 ppm) which skew the average from 1.6 ppm 4.6 ppm and the median from 0.8 ppm to 0.9 ppm.

*** These averages do not include the three "Open Water " (33.1, 10.9, 37.8 ppm) and two "Confined " values > 10.0 ppm (63.1, 70.5 ppm).

Table 3 : Tip Correlation with Loss on Ignition and Oil and Grease

Correlation	r- Value
Loss on Ignition vs. Tip Reading	0.04
Oil and Grease vs. Tip Reading	0.01

The r- value, know as the Pearson product - moment correlation coefficient, is an index of the strength of linear relationship between two variables. Values range from -1 to +1, where positive values of r indicate the tendency for one variable to increase with the other. An r - value of 0 indicates no linear relationship between the two variables.

Instrument Error

The manufacturer of the MicroTip, Photovac Inc., gives the following accuracy and precision figures for the instrument after calibration with Zero Gas and 100 ppm isobutylene Span Gas :

Accuracy : within + / - 2 ppm or + / - 10% for 0 to 100 ppm
within + / - 15% for 100 to 1000 ppm
within + / - 20% for 1000 to 2000 ppm

Precision : + / - 1% (100 ppm isobutylene)

Figure 1 Tip Readings July22/91-Nov25/91

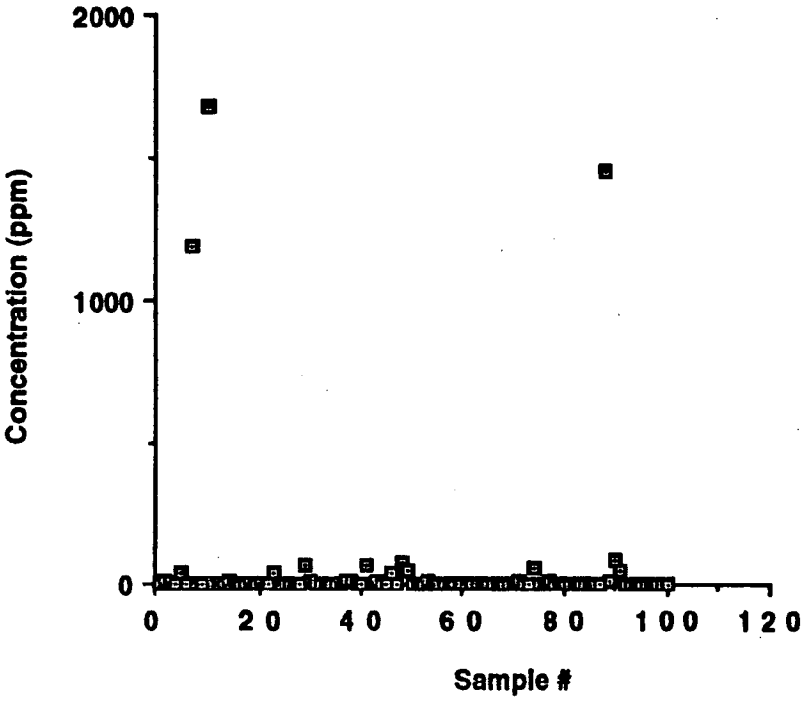


Figure 2 Tip Readings Below 1000 ppm

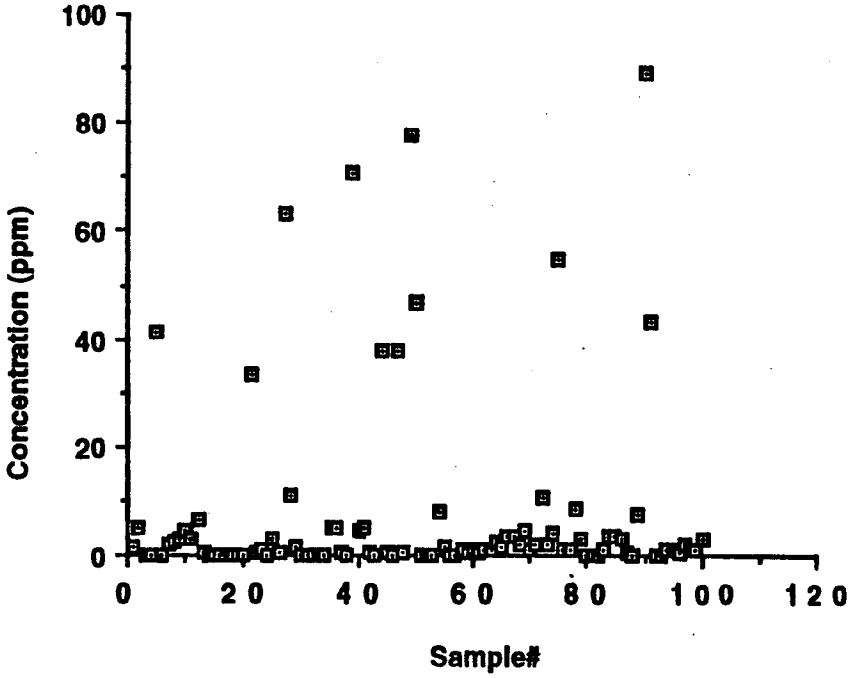


Figure 3 Tip Results for ILQCP-Approved Soil

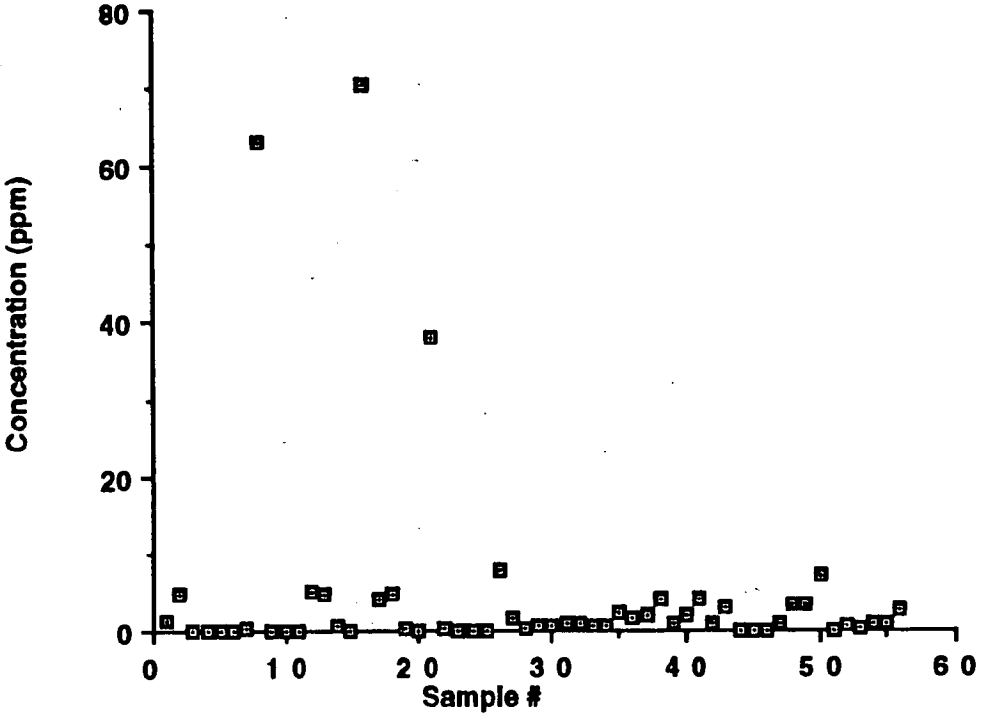


Figure 4 Result of Eliminating Readings >10 ppm from Figure 3

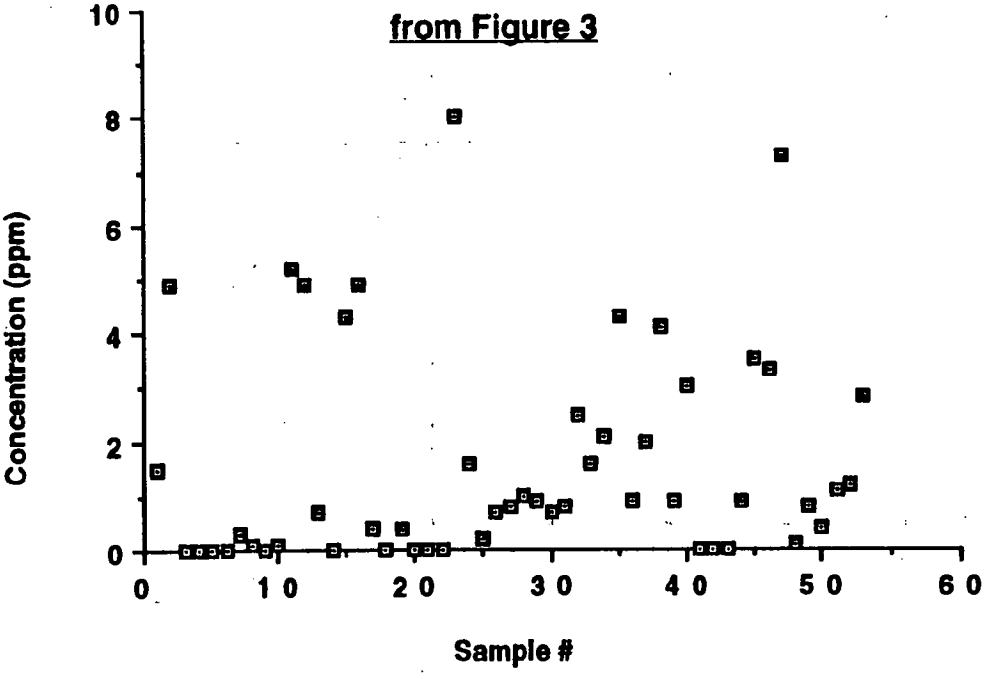


Figure 7 Tip Results for Material Other Than Soil

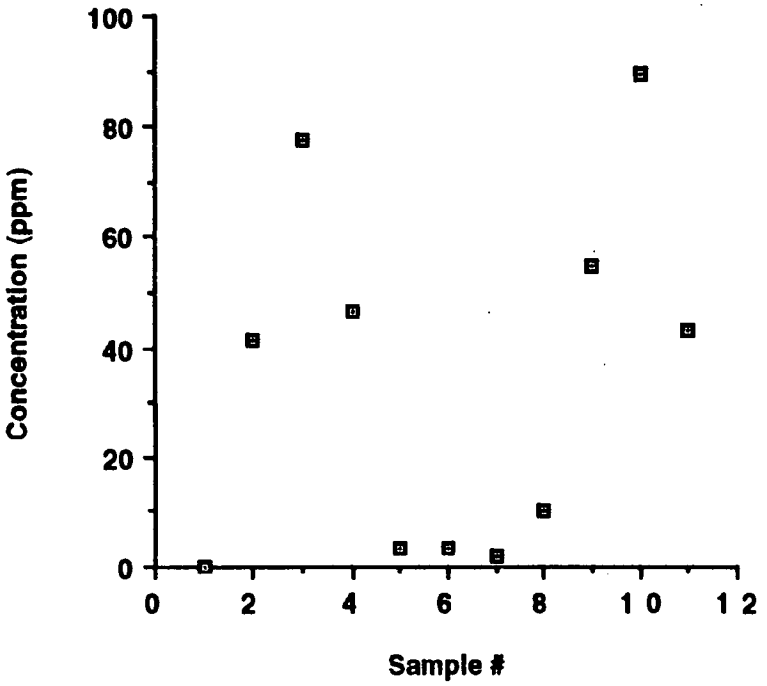


Figure 8 Tip Readings for Fresh and Ground Asphalt

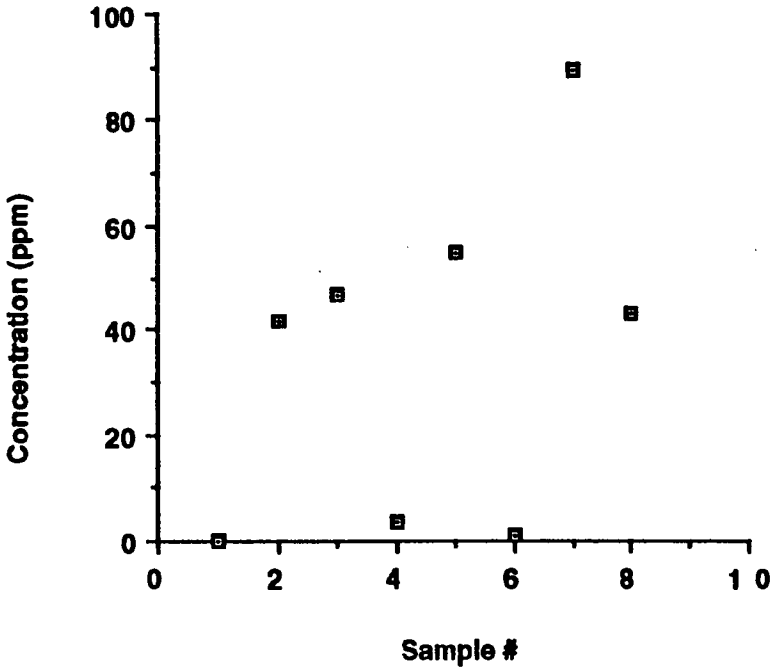


Figure 5 Tip Readings for "Open Water" Material

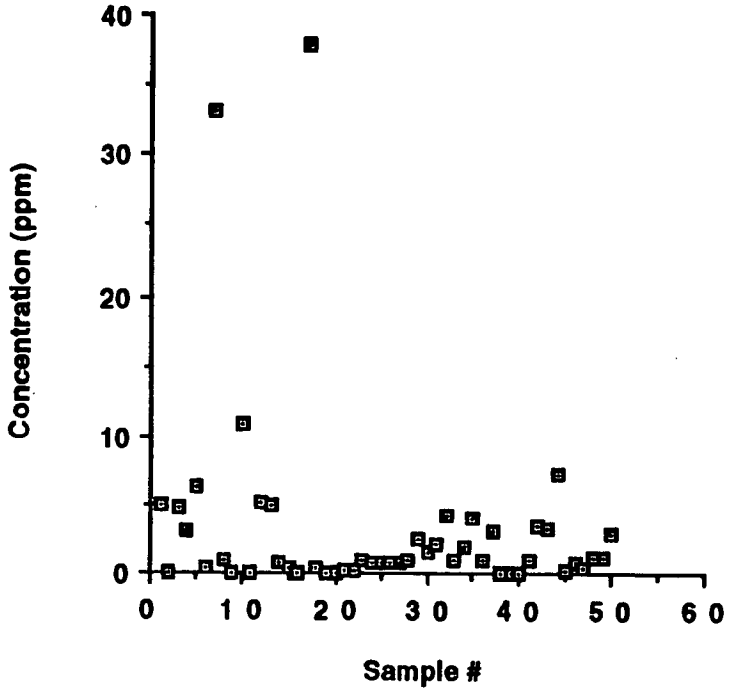


Figure 6 Tip Readings for "Confined" Material

